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Evidence of the Shaming Effect: A Look at NCAA Football

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EVIDENCE OF THE SHAMING EFFECT: A LOOK AT NCAA FOOTBALL

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Abstract

This paper addresses the general theory of shaming and the effects it has on criminal behavior. There has been much debate of the use of shaming in the criminal justice system and the effects it has on criminal behavior. The lack of quantitative data has limited such debates to theory without evidence. This paper applies the theory to NCAA football statistics to study the behavior of football players on the field, to explain the way people and how people respond to shaming. The analysis is based on seasonal team statistics of all division I football teams in correlation with a rule change that imposes a shaming effect on individual football players. It shows the referee stating the number of an individual who committed a penalty increases the cost of committing the penalty. The findings are unambiguous and statistically significant in the behaviors of the teams and the number of penalties committed after the introduction of shaming the individual players. The research of this paper suggests that ostracizing an individual for a crime will decrease the number of crimes committed in the aggregate. We would expect the incentives created by this rule to be similar to those created by public identification for sex offenders, known as the shaming effect.

Dedication

I dedicate my thesis to my family and friends for all the motivation and support that I received during my career as a graduate student at Clemson University. Without such amazing people in my life this goal of mine would have never been achieved.

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I would like to acknowledge the members of my advisory board for all the help they have given me throughout this process. I want to thank my advisor Dr. Howard Bodenhorn for many things beyond the accommodation of my countless barrage of questions. I would like to thank Dr. Raymond Sauer for all the help and guidance that was given to me during my career at Clemson University. I would also like to thank Dr. Robert Tollison who taught me to think outside of the box with my economic studies, and for sharing the brilliant theory that became the basis of my thesis.

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1 The Shaming Effect

1.1 Introduction

The sports community has given economists an economic environment that is easily observable in which the contestants behave according to identifiable incentives. This paper looks at NCAA football statistics to see how football players act on a field, in hopes of explaining the way people behave in everyday life. In February 2004 the National Collegiate Athletic Association (NCAA) changed the rules in football so that a referee must call the number of the individual player when a penalty is committed:

> ***Rule 11-2-1-d:*** *The referee, if he is equipped with a microphone, will announce the number of the player committing the foul. Intent: To provide key information on players committing fouls faster. Rationale: Officials already are required to report the position or number of the player who fouled to the player's coach (Rule 11-1-3-b). Depending on the circumstances of the game, it can take several plays for this information to be delivered to the coach. Using the referee to deliver the information provides all interested parties (coaches, media outlets, spectators, etc) with the correct information faster.*[1]

The act of committing a penalty on a football field is comparable to committing a crime. This paper examines the relationship of ostracizing an individual player for their penalty and the aggregate number of penalties committed by a team after the rule change. The NCAA's rationale of the rule change (stated above) was not to have such a shaming effect; this paper tests that a rule change has an unintended shaming effect when added to an existing penalty. Past research suggests that introducing the shaming sanction for a specific crime will produce a deterrent effect of the specific crime. We would expect the

[1] http://rules.bafra.org/rules/docs/2005/ncaa2004changes.htm

incentives created by this rule to be similar to those created by public identification for sex offenders.

The shaming effect can be a useful tool to show the wrongdoer the severity of his actions, and when used correctly, to help reintegrate the individual into society. This paper recognizes that the sanctions in a football game or other sporting events are not exactly the same as typical sanctions on the criminal justice system, including but not limited to incarcerations, or other punitive sanctions. This paper shows that when adding the alternative sanction of shaming to an already existing sanction there will be similar results as if there was an increase in the cost of committing a crime to the offender. Introducing the shaming effect will tend to have a negative correlation with the number of times that specific crime is committed.

Professor Packer (1969) states that, "There are two and only two ultimate purposes to be served by criminal punishment: the deserved infliction of suffering on evildoers and the prevention of crime."[2] Throughout the history of the criminal justice system there have been sanctions other than punitive punishment as a means of prosecuting criminal law. The notion of shaming has been a significant form of punishment throughout human existence and played a major role in early forms of punishment. For many years, the legal system would use public humiliation as an alternative sanction. Sanctions like the pillory were used to psychologically harm the offender, generally with little physical punishment.[3] Publicly humiliating sanctions such as public hangings, flogging, and the pillory were used to shame people and at the time ostracize them from their community. Such sanctions have not been used in the criminal

[2] Packer, Herbert L. (1968), *The Limits of the Criminal Sanction*.
[3] It is noted that occasionally crowds hurled objects at people in the pillory causing physical harm.

justice system until recently, as judges have used creative ways to sanction wrongdoers. Many judges noted the use of alternate sanctions were an attempt to address the current problem of overcrowding in United States' prison system as well as an alternative way to reduce the cost that incarcerating criminals has on tax paying citizens.[4]

Overcrowding of prisons in the United States has depleted individual states' budgets in recent decades. In response, the legal punishment of criminal behavior has become more creative by the criminal's expense. Judges now use alternative sanctions by reverting back to the idea of shaming criminals. It is argued in recent literature that the reintroduction of such alternative sanctions may not be as beneficial to society as the convicting judges assume. Jon Brilliant, a strong advocate against the use of shaming, states that criminal punishment is to help the criminal and society with retribution, rehabilitation, deterrence or incapacitation.[5] The shaming effect can have a harmful backlash to society if it is not used appropriately.

Alternative sanctions have complicated the basic economic crime models shown by (Becker 1968; Tullock 1971; Barro 1973; Ehrlich 1973, 1975; Becker and Lands 1974; Becker and Stigler 1974). The three aspects of the market of criminal behavior that consume resources are detection, prosecution and punishment. Similar to other economic models, the market of criminal behavior is based on the analysis of supply and demand of criminal activity. The supply of criminal behavior is a function of expected cost and

[4] It is thought that community service can have a shaming effect as well as a positive output for the community.

[5] Brilliant, Jon (1989). *The Modern Day Scarlet Letter: A Critical Analysis of Probation Conditions.*

benefit analysis by the criminal, while the demand of criminal behavior derives from the Free Lunch Theorem[6] – it is not efficient for the state to prevent all criminal activity.[7]

1.2 Recent Shaming Sanctions

In the late nineteenth century courts began claiming 'scarlet letter' punishment, such as pillories, as "cruel and unusual" under the Eighth Amendment.[8] Beginning in the mid-1970's judges began to use social humiliation as a means of punishment for convicted criminals of specific crimes as a term for probation. Many of the cases that are discussed in this paper were repealed and reversed for different means. One of the common reasons of the appellate court's decisions is the argument that probation is not meant to be a form of punishment. This paper does not argue the legality of probation as a form of punishment. These cases are briefly discussed in this paper to show the creativity judges have used to enforce the shaming effect, while opening the idea that if shaming is used correctly (addressing it as a punishment) it can be quite effective.[9]

In *Goldschmitt v. Florida* (1986), Goldschmitt, a convicted drunk driver, was required by the sentencing court to place a bumper sticker on his car that read, "Convicted D.U.I – Restricted License."[10] One of Goldschmitt's many arguments in his appeal was that the bumper sticker was analogous to pillory, and was "cruel and unusual

6 Greg Mankiw states, "To get one thing that we like, we usually have to give up another thing that we like. Making decisions requires trading off one goal against another." The idea is that the social cost of prevent all crime will be greater than the social cost of some criminial activity.

7 McCormick, Robert, and Robert Tollison. (1968) *Crime on the Court*.

8 See Hobbs v. State, 133 Ind. 404, 409, 32 N.E 1019, 1021 (1893). Courts declared that pillories and stocks as "cruel and unusual punishment" and in violation of the constitution.

9 The argument of "cruel and unusual punishment" is also not addressed in this paper, as the courts mentioned did not overturn the cases on such an argument.

10 *Goldschmitt v. Florida*, 490 So. 2d 123, 124 (Fla. Dist. Ct. App. 1986) (court rejected a first amendment challenge to such a condition). For more detail of the case, see Case Comment, The Bumper Sticker: The Innovation That Failed, 22 NEW ENG. L. REV. 643 (1988).

punishment." The court stated that the use of the bumper sticker was far from analoguos to pillory, and that the "scarlet letter" punishment was not necessarily offensive to the Constitution. Similarly, *People v. Letterlough* (1995),[11] the New York Court of Appeals found placing a sticker saying "Convicted D.W.I," to be a form of punishment and could not be classified as probation.

Another approach courts adopted with drunk driving offenders was to place an advertisement in the local newspaper of the offender's hometown. In *Lindsay v. State* (1989),[12] the court sanctioned Lindsay, a convicted drunk driver, to place an ad in the newspaper describing his crime. Among other arguments, Lindsay stated that the punishment caused ridicule and humiliation. The court quickly dismissed his argument stating, "[t]here is inherent irony that the stronger he makes the case for humiliation and ridicule, the more he tacitly concedes that [the punishment] is reasonably appropriate to its penal ends."[13] The court upheld the decision, and required Lindsay to place a newspaper ad describing his crime.

The final two cases mentioned are courts requiring offenders to place signs on their property of residency warning people of their crimes. In *State v. Bateman* (1989),[14] the court was sanctioning a convicted child molester. The Oregon court required Bateman to place a sign in his yard that read, "Dangerous Sex Offender – No Children Allowed." A similar sentence was passed down in the 1997 Illinois case, *People v. Meyer*. Meyer was convicted of aggregative battery as he struck and kicked another man on his property that was returning borrowed auto parts. The Illinois trial court sentenced Meyer similarly to

[11] *People v. Letterlough*, 655 N.E.2d 146 (N.Y. 1995)
[12] *Lindsay v. State*, 606 So.2d 652(Fla. Dist. Ct. App. 1992).
[13] *People v. Letterlough*, 655 N.E.2d 146 (N.Y. 1995)
[14] Brief of Appellant at A-2, *State v. Bateman,* 95 Or. App.456, 771 p.2d 314(1989) (Or. App. No. A44854)

the *Bateman* case, requiring him to place a sign on his property that read "Warning! A Violent Felon lives here. Enter at your own Risk."[15] Unlike the *Bateman* case, the supreme court of Illinois overturned the ruling of the probation condition.

All of the cases mentioned above show that in recent history the judicial system has begun to use the shaming effect as a means of punishment. As mentioned before many of these cases were overruled because they violated certain probation conditions of certain states.[16] These cases do reveal the use of shaming as a means of deterrence, and if used appropriately it may have significant effect in deterring crime.

1.3 Literature of the Shaming Effect

The main methodology of the shaming effect (Braithwaite 1989) suggests that an individual's participation in criminal activity is influenced by the individual's participation in, and observation of, criminals being shamed for their wrongdoings.[17] Shaming sanctions can be defined as "…those sanctions that shine a spotlight on offenders in order to warn others of antisocial activity and of the miscreants perpetrating the deeds." (p. 188).[18] The shaming effect directly invokes society's public repulsion of the criminal activity an individual had partaken in.[19] Note that imprisonment or passing fines to the individuals convicted can be argued to have a degree of shaming. For the purpose of this

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[15] *People v. Meyer* 680 N.E.2d 315 (Ill. 1997)

[16] Some states have determined that any punitive sanction not mentioned in the listed in the statutory guidelines of probation should be immediately struck down. (Book 1999)

[17] The shaming effect's ideas and theories are periodically being refined (Ahmed et al. 2001; Braithwaite 1999).

[18] Netter, Brian. (2005), *Avoiding the Shameful Backlash: Social Repercussions for the Increased Use of Alternative Sanctions.*

[19] Netter, Brian (2005) "…the stigmatizing effects of publicizing crime are costly for the people being shamed, and these costs have the potential to deter shamed convicts from repeating their criminal acts." (p. 188).

paper shaming is a direct use of a person's psyche as a means of punishment. This can be any feeling that a person may experience when individualized for their actions. This paper does not address the possible effect of shaming that can be found in commonly used sanctions.

There are several counter-arguments of the effect shaming has on crime and its use in the judicial system. First, shaming may be cruel and unusual. Secondly, shaming effect may not deter in a modern, anonymous society. This much-used argument is not sufficient in that the shaming effect can in fact work in such a society in the contexts in which they are most commonly used. The shaming effect can have a deterrent effect on sexual, commercial, and certain other offenses.[20]

A third compelling argument, by Witman (1998), states that shaming "represents an unacceptable style of governance through their play on public psychology." (p. 1059). Witman does not look at the effect shaming has on the offender but what it creates in society. He argues that when introducing the shaming effect on society, it closely relates to an official lynching environment. Such justice will represent an improper relationship between the state and the crowd, even if shaming had no impact on the offender. Shaming can bring about a form of social hierarchy, while also promoting an idea of social brutality and licentious behavior.

As mentioned above, non-shaming sanctions of criminal activity may cause embarrassment and lead to communal segregation outside of incarceration of the criminal. Embarrassment is regularly considered to be an incidental negative

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[20] Witman (1998), *What's Wong with Inflicting Shame Sanctions?*

consequence of the *non-shaming* sanction passed by the judicial system.[21] The difference is the shaming effect intentionally inflicts embarrassment to the wrongdoer, which can lead to society ostracizing the individual. Judges that pass down the shaming sanctions agree that the fear of social banishment will deter people from committing similar crimes.

Braithwaite argues that it is not simply the embarrassment or communal ostracizing that will have the strongest deterrent effect of a specific criminal activity. In fact, he says that simple banishment may lead to stigmatization, which can be defined as, "disintegrative shaming in which no effort is made to reconcile the offender with the community." (p. 101).[22] Stigmatization can have an adverse effect on the individual and criminal activity, causing banished individuals to find "criminal subcultures," which support criminal behavior together and have a higher probability of being a repeat offender. For shaming to be effective, the community must be willing to reintegrate the offender back into law-abiding society by means of "words or gestures of forgiveness or ceremonies to decertify the offender as deviant." (p. 100-1).[23] It is said offenders who were shamed and reintegrated back into society have a low probability of being a repeat offender of their misdoings. Shaming with reintegration is expected to have a greater effect of deterrence than sanctions without shaming and reintegration.

The effects the shaming sanctions have on an individual are dependent on varying characteristics of each individual. First, the deterrence theorists assume that sanctions, especially shaming, instill fear into some, or most of the onlookers. The punishment must be one that instills a significant amount of fear unto the onlookers, or scare a significant

[21] Toni M. Massaro, (1991), *Shame, Culture, and American Criminal Law.*
[22] John Braithwaite, (1989), *Crime, Shame and Reintegration*
[23] John Braithwaite, (1989), *Crime, Shame and Reintegration*

amount of onlookers.[24] This fear can affect individuals differently, as they do not want to be the ones shamed, or shamed again if the offender is a repeat offender. The effect of shaming tends to be overstated on the personal level, thus shaming defenders argue that public humiliation can have a powerful cost (Gilovich and Savitsky 1999). Secondly, there is a not sufficient data that addresses the shaming, or deterrence, effect. This paper addresses the problem of lack of data on the shaming effect of individuals in section II.[25]

Braithwaite (1989) also addresses variables that affect the individual's response to the shaming effect. The responses to the shaming effect are theorized to be increased by the individual's *interdepedency*, or a measure of how the individual is dependent on others in their society, as well as how others depend upon them to achieve productive outputs. Also the society's overall interconnectedness, or *communitarianism,* will increase the effect shaming has on an individual. The less interdependent an individual the less likely he or she is to participate in the shaming of the offender. This will result into a lesser effect reintigrative shaming will have on the offender.[26] The less communitarian a society is, the less likely they will shame the individuals. This will tend to result in no reintigrative shaming, or non-reintigrative shaming which can have an inverse effect.[27]

Shaming, when used correctly, can be a useful tool to show the wrongdoer the wrongness of his actions. Book (1999) states that, "Because shaming affects humans at a

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[24] Toni M. Massaro, (1991), *Shame, Culture, and American Criminal Law.*

[25] Kappelhoff, Mark, of the American Civil Liberties Union states that with shaming criminals "there's been no research to suggest [that] it's been effective in reducing crime." Tony Allen-Mills, (1997) *American Criminals Sentence to Shame.*

[26] Adam Jay Hirsh argues that the pillory was no longer effective as a shaming sanction when it was preformed before onlookers who the offender had little or no contact with, and needed no future personal contact. (1992) *The Rise of the Penitentiary Prisons and Punishment in Early America.*

[27] Braithwaite has continued his original theory and found that in recent refinement stigmatizing and reintegrative shame are not thought to be on opposite ends of the same continuum (as the original theory conceived) but that they are independent dimensions that may have no effect, or interact with one another. That is, where there is a high degree of shaming they are thought to act independently, and they are theorized to interact when there is a low degree of shaming. (Braithwaite and Braithwaite 2001: 42-44).

clinical, psychological level, it could work on the punitive level." (p. 675). Public humiliation or the use of moral conscience can be an effective tool for the judicial system when used in the correct way. Braithwaite (1989) states that, "You cannot take moral-content out of social control and expect social control to work." (p. 142). In a society where the prison systems are over-crowded or do not seem to work reintegrating individuals back into society, shaming can be a useful sanction. Kahan (1996) suggests that there is nothing wrong with humiliation sanctions, at least when faced by the threats of the awful turbulence incarceration brings; but in fact when offenders are given the choice of prison or shaming they routinely prefer shaming.[28]

When introducing shaming sanctions as an alternative sanction to a crime previously sanctioned by incarceration, they directly decrease the costs to the taxpayers when compared to incarcerating the wrongdoer.[29] There are many caveats when using shaming sanctions in the criminal justice system that will be introduced in the next section of the paper. The next section will discuss the economic model used in this paper, by quantitatively looking at the statistics of the NCAA and the effect a rule change had on the penalty rates of college football.

[28] Kahan, Dan M. (1996). *What Do Alternative Sanctions Mean?*

[29] Dan Kahn, a proponent to the shaming sanction states, "[S]haming is a potentially cost-effective, politically popular method of punishment" that will be effective in the future because people, "want[] more from criminal punishment. They want a message. They want more condemnation of the offender." Tony Allen-Mills, (1997), *American Criminals Sentenced to Shame*

2 Model and Data

2.1 Supply Side the Crime Model: Associated with penalties.

The NCAA rule change of 2004 allowed this paper to use well-documented data to explore the notion of shaming. The data suggests that the rule change has an inadvertent shaming effect that accurs to the individual offender. This paper looks at the supply side of the economic crime model, which assumes a person would commit a crime when his expected utility to him exceeds the expected utility he would receive by using his time and resources towards other productive endeavor. It is assumed that players want to maximize their team's chance of winning the game. Assuming that individuals are rational and utility maximizing, there theoretically should be no shaming effect. That is, every individual should commit a penalty when it is in the best interest of the team. The individual will rationally decide when it is the correct time to commit a penalty, in efforts to increase their team's probability of winning the game. For instance, an offensive lineman holding to protect his quarterback from taking a sack for more than ten yards (as fumbling the ball, or getting injured) or a cornerback committing pass interference (a fifteen yard penalty) to prevent the receiver from catching the ball (a gaining more than fifteen yards). A player thinks rationally toward the entire team's incentives, and thus in the aggregate the number of penalties should remain unchanged after the rule change of 2004.

For a player to rationally commit a penalty the expected cost of committing a penalty must be less than the expected alternative. Looking at the supply side of the crime model shown by Becker (1968) Formally:

, (2.1)

where P_i is the number of offenses player *i* would commit in a given season, d_i is the probability of detection by the referee and the referee calling the penalty, f_i is the fine the player receives, and u_i is a portmanteau variable representing all other influences[30].

The player only pays the fine f_i if he is detected by the referee for committing the penalty, and otherwise does not pay the fine. Due to the uncertainty facing player *i* an increase in both d_i and f_i would decrease the individual's expected utility of committing a penalty and would tend to decrease the number of penalties committed by player *i,* if the player is risk neutral. That is, the probability of paying the fine or the fine itself would increase:

(2.2)

Changes in u_i could also have expected results. For example, a player's experience through the years would tend to reduce the number of penalties, or a lower skill gap between the offending player and his substitute would tend to reduce the number of penalties player *i* commits, assuming the player called for the penalty wants to stay on the field and is punished by substitution for committing undesired penalties. The threat of substitution

[30] The variable f_i can be better explained as the loss of yard, or down given to the offending team as well as the individual cost given by the shaming effect. Assuming the players incentives are aligned with the teams, as well as the effect committing a penalty has on the individual player. The variables d_i and f_i can be considered distributions dependent on the referees. The variable u_i includes, among other things, influences such as, the size or skill of player *i* (which can be considered a function of the experience of the player), position of player *i*, the substitution rate of the team of players who commit a penalty (which is a function of the skill gap between the player who committed the penalty and his substitute), as well as the substitution rate of committing a penalty and the player using his resources to cleaner play, or learning how to disguise such penalties (and decrease the probability of being detected).

would incentivize the player to have clean play or commit fewer undesired penalties. Also, substitution would imply the player is involved in fewer future plays; when the player is not on the field he cannot commit any penalties.[31]

The model used in this paper assumes that the probability of conviction remains constant. Formally shown by McCormick and Tollison (1984) it is recognized the referees do call penalties if an individual did or did not commit a penalty. This paper assumes that the probabilities of proper conviction as well as "false arrests," are unchanged. This paper focuses on the increase in the fine imposed on the individual for committing crimes. It is assumed that the shaming effect given by the 2004 NCAA rule change will increase the cost of committing a penalty. Before Becker's (1968) crime model it was generalized that the probability of detection has a greater effect on lowering criminal behavior.[32] Becker shows it is the individual's preferences to risk that determine the magnitude of the effect an increase in the fine has on the individual.[33]

To show the effect of an increase in fines by the shaming effect, this paper looks at the expected utility of the individual who committed the penalty:

(2.3)

[31] Steve Levitt (1995) notes that incapacitation is different than "net" incapacitation. He uses the example that if a drug dealer is incapacitated, another drug dealer will simply take his place. If one criminal is gone, then other criminals will simply commit the crimes of the incarcerated criminal. "Net incapacitation effects will be less the number of crimes the individual commits when free." (Footnote 4) That is, if a player *i,* is called for a penalty and is replaced by his substitute, player *j,* it is uncertain if player *j* will commit more or fewer penalties than player *i.* Assuming that player *j* is a substitute means that all else equal player *j* has some attribute that make him less desirable (incorporated in the variable u_j):

The effects a substitution will have on penalties in the game depend on the specific qualities of the individual players, *i* and *j*, as well as the magnitude of this "skill gap."

[32] Lord Shawness (1965) said, "Some judges preoccupy themselves with methods of punishment. This is their job. But in preventing crime it is of less significance than they like to think. Certainly detection is far more important than severity of punishment."

[33] Becker (1968) shows that an increase in fines have a greater effect on individuals who are risk adverse, while an increase in the probability of arrest have a greater effect on risk seeking people, and they have the same effect on risk neutral people.

where b_i is the benefit of committing the penalty, U_i is the utility function, and f_i is the penalty of committing the penalty, including the sanction of the referees as well as the psychic effects given by the shaming effect or other unobserved effects.[34] From equation 2.3 it can be shown the effect an increase in fine can have on an individual:[35]

(2.4)

as long as the marginal utility of the benefit is positive.

This paper addresses the shaming effect in committing a penalty as an increase in the fine the individual receives. The rule change did not increase the sanction the player's team receives, but introducing the shaming effect should tend to increase the cost of committing such a penalty on an individual level. This shows that with the shaming effect, the individual's incentives may become unaligned with the teams. It is recognized that before the rule change the coach did eventually find out the player who committed the penalty, but depending on the circumstances of the game there could be a lag of time to when the coach received the information. It is recognized that in collegiate football during the time period of this data all teams study films of past games and the individual who commits the penalty will be identified. This paper considers the increase in the fine the player experiences due to the rule change as the immediate recognition of his wrong doing not only to the spectators or media outlets, but more importantly to his teammates as well

[34] The variable b_i can be defined as the "edge" the individual receives by committing the penalty, as well has the prevention of further losses the individual (assuming aligned incentives with the team) may have. Mentioned earlier, these can be prevention of injury, fumble, sack, or touchdown reception.

[35] The effect of an increase in probability of detection:

as long as the marginal utility of benefits is positive.

as the coaching staff, thus making teammate reactions and substitutions by the coaching staff much more instantaneous.

The past models are based on the individual, which depend on the set of variables, d_i, f_i and u_i that are expected to differ significantly across persons. For simplicity this paper assumes the averages of the variables, *d, f, u* to find the market of penalties:

, (2.5)

where *d, f, and u* can be defined as the weighted averages of d_i, f_i and u_i:[36]

, (2.6)

Equation 2.5 is expected to have similar effects at the individual function, and easily transferred into equation 2.3:[37]

. (2.7)

This shows that as *f* or *d* increase there will be a decline in *p,* with *f* having a more significant effect if the offender is a risk avoider, *d* having a more significant effect if the offender is a risk seeker, and having the same effect if the offender is risk neutral.

Given the nature of football it is difficult to measure the risk preferences of individual players. The dynamics of the game can make certain penalties much more

[36] *f* and *u* can be found using the same equation as 6.

[37] Similarly the effects on an increase in the fine or probability of detection can be easily transformed:

as long as the marginal utility of the benefit is positive.

costly than others.[38] Such penalties can drastically affect a team's chances of winning a game. In these situations individuals may be more risk adverse than they normally would be in a different situation. His teammates and coaches immediately know that it is his fault the touchdown was called back. In other circumstances a penalty might not be as detrimental to the team's success. In this case the player should not have such a shaming effect. This paper assumes that on average each player rationally chooses when to commit a penalty, and thus are risk neutral. Thus, with this model the introduction of the new NCAA rule should be negatively related to committing a penalty. Few empirical studies have analyzed the shaming effect on crimes due to lack of statistics on the subject, which lead people to question the effectiveness of shaming.[39] There have been many studies of the shaming effect in past literature, but few include quantitative examples of the shaming effect. The next section will explain the data and variables used and analyze the effect the rule change has on penalties in the collegiate level of Division I football.

2.2 Data

The data used in the paper came from the NCAA statistical archives. I collected the data and created the data set that consists of all division I football teams (up to 121 different teams) from 2000 to 2009. I found data on each football team which entails: each team's conference, the number of penalties each team committed each year, the yards

[38] Dynamics of the game that a penalty can have a greater affect can be on short third downs, if the offense is positioned near their goal line, or the opposing team's goal line. Where a penalty may have little affect is if the offense is in the middle of the field and will have to punt the ball to the apposing team with or without the penalty called.

[39] Mr. Kappelhoff states about the shaming effect, "there's been no research to suggest it's been effective in reducing crime." (Yale L.J. of James Q. Witman 1988)

of penalties committed each year, the number of games played each year, the number of defensive plays each team had each year, the number of defensive yards each team

Table 2.1: Summary Statistics of Variables

Summary Statistics		
Variable	Mean	Standard Deviation
penaltiespergame	6.548504	1.33794
yardspergame	55.72627	12.05976
games	12.15726	0.8914878
defplayspergame	69.39947	4.523473
defydspergame	367.9658	55.41535
deftdspergame	3.222718	0.9549879
offplayspergame	69.59031	4.731116
offydspergame	374.522	59.08698
offtdspergame	3.35865	0.9710087
intpergame	1.038809	0.367999
carriespergame	38.25127	6.297374
rushydspergame	154.817	49.49693
rushtdspergame	1.594219	0.6563596
passattemptspergame	31.33905	6.901336
passydspergame	219.6414	57.55236
passtdspergame	1.505101	0.6403647
avgpointdiffconf	-0.0118995	6.739276
avgpointdiff	-0.0146392	11.49038
avg	26.64638	6.970038
wins	6.339316	2.951315
losses	5.817949	2.529927
avgattendancepergame (in thousands)	43.31635	25.49461
homeegames	6.045455	0.8644584

allowed each year, the number of touchdowns the defense allowed each year, the number of offensive plays each team has each year, the number of offensive yards each team had each year, the number of touchdowns the offense scored each year, the number of passing and rushing touchdowns each team scored each year, the average point differential each team has each year (including and excluding non-conference games), the average score each team had each year, the number of wins each team had each year, and the number of losses each team had each year, the average attendance each team had each year, the total attendance each team had each year accumulative, the number of home games each team had each year.

3 Regression and Results

3.1 Yards Penalized Per-game

This paper notes that penalties in football and criminal activities are not perfectly analogous to one another. However, there are some similarities. Individuals on the collegiate level do not get fined for committing penalties on the field, but they can lose their scholarship for poor play. There is no incarceration such as imprisonment on the football field beyond being ejected from the game, but the coaching staff can substitute the player, thus preventing him from further play and or penalties on the field.[40] This theory suggests that, all else equal, if the criminal court were to add a shaming sanction to a specific crime, there will tend to be a decline of that specific crime at the margin.[41] The theory of this paper is to predict the sign of equation 2.7 to be non-positive; that is, an increase in the cost of committing a penalty due to the shaming effect will lead to fewer penalties on average. This theory also assumes risk neutrality for the players, for simplicity of the model as well as knowing their risk preferences fluctuate throughout the

[40] This paper is only dealing with the deterrent effect of crime when a shaming sanction is added to a preexisting sanction. When a player in college football is substituted, there is an immediate replacement that takes his position. As mentioned before there is not incapacitation effect in this analysis, because of the replacement of the penalized player who will also rationaly decide when to commit a penalty.

[41] This statement is assuming that all criminals are risk neutral which usually not the case. When introducing the shaming effect into a criminal sanction, one should be cautious as to which crime they are shaming. If the crime committed by criminals whom usually portray qualities of risk aversion, then the shaming will tend to have a significant outcome in the declining of that specific crime on the margin. On the other hand, if a shaming sanction was added to a crime that is usually committed by risk seekers, there will tend to be little effect on the reduction of that specific crime on the margin.

football game. Section IV will further investigate and explain why this is a viable assumption.

When conducting my regression analysis, this paper used unbalanced panel data across different teams for different years; during the time period of the data collected there were teams that were entering or leaving the NCAA Division I. The regressions used are cross-sectional analyses allowing for random effects.[42] This paper uses the random effect model because the unobserved variable related representing the rule change of 2004 does not change over time, and the effect of the variable is uncorrelated with all explanatory variables. The random effect model also allows the error term assumed to vary stochastically over team or year. Given the assumptions in my model, using random effects cross sectional analysis is much more efficient than using a fixed effect model.[43]

To estimate the sign of EU/ F, changes in *d* and *b* need to be controlled, that is, the weighted average of the probability of detection and benefit of committing a penalty are assumed to be constant. As mentioned before, these assumptions are not unreasonable for the period of this data because there have been no significant rule changes by the NCAA that would have significant effects of either variable.

In table 3.1 the model (1) estimates the yards penalized per game (*yardspergame*) as a function of a dummy variable representing the rule change in 2004 (*after*), the variable *after* takes the value of one for years 2004-2009 and a value of zero for years 2000-2003, offensive yards per game (*offydspergame*), the team's average offensive

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[42] The assumptions for the random effects model allows the estimator to be unbiased and asymptotically normally distributed as observations increase with a fixed time period.

[43] Appendix 1 shows that using random effects is efficient by running a base regressions, and using the Hausman test, which was unable to reject the null hypothesis that the differences in the coefficients are not symmetric.

touchdowns per game (*offtdspergame*), the team's average number of plays per game (*offplayspergame*), the number of wins and losses a team has each year (*wins*) (*losses*), the number of home games each team has each year (*homegames*), the average attendance each team has at their respected home games (*avgattendance*) and a dummy variable for each conference each team plays (*conf*).[44]

In college football, all else constant, it is believed that teams that play at their home stadium tend to have an advantage. There are a few reasons behind this argument, which may have an effect on a team's number of penalties committed. First, a team playing at home has the majority of the fan base cheering for their success and giving the home team an immeasurable momentum effect. Second, all else equal, a home team will tend to have a bias of the referee's calling penalties in their favor.[45] Finally, home games may have an effect because many teams schedule easier games at home, such as homecoming, or inter-conference play at the beginning of the season.

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[44] Below is a similar regression as model (1) with the variables pertaining to the defense of the individual team, where *defydspergame, deftdspergame,* and *defplayspergame* are the average number of yards and touchdowns the defense of the individual team allowed per game, and the average number of plays the defense plays per game respectively. Note the conference dummy variables are suppressed.

$$Yardspenalizedpergame = \underset{(40.87)}{5.5} - \underset{(-5.08)}{3.016048}after + \underset{(9.06)}{0.8346832}defplayspergame - \underset{(-6.98)}{0.087266}defplayspergame$$
$$+\underset{(5.20)}{3.747624}deftdspergame - \underset{(-3.46)}{1.305864}wins - \underset{(-4.94)}{2.146713}losses - \underset{(-0.77)}{0.352365}homegames - \underset{(-0.69)}{0.021683}avgattendance$$
$$+ v_{it},$$

With z-statistics presented in the parenthesis's, $v_{it} = a_i + u_{it}$, and a_i is the unobserved effect assuming it is uncorrelated with each explanatory variable in all time periods.

[45] This could be a referee calling fouls for the visiting team that they are not consistently calling for the home team. Referee bias is an observable effect in many sports such as professional and collegiate basketball, and can be thought of as a function of the home team's fan base (a referee does not want to call a marginal foul on the home team knowing the uproar it will bring about in the stands), as well as individual players on the team (seen in the NBA), or the coaching staff (more evident in college basketball). All else equal, the players should recognize the negative effect of home games tend to have on the probability of being convicted of a penalty, and behave optimally. In the aggregate home games should have no effect on penalties, due to the knowledge of the decrease in probability and players capitalizing on it.

Model (2), model (3) and model (4) break the offensive variables into separate variables representing the style of play of individual teams. For example model (2) divides *offydspergame* into two separate variables *rushydspergame* and *passydspergame*, representing the average rushing yards per game and average passing yards per game respectively. Model (3) divides *offplayspergame* into the two variable *carriespergame* and *passattemptspergame*, which measure the average number of rushing plays a team has per game, and the average number of passing plays a team has per game. Model (4) then separates *offtdspergame* into the respected average rushing touchdowns and passing touchdowns per game, *rushtdspergame* and *passtdspergame*. The style of play a team exercises can have an effect on the number of penalties for different reasons. A team who focuses more on their passing offense will by the nature of their style have to protect the quarterback more often than a team who is more inclined to run the football. While, a team who is more of a "ground and pound"[46] football team may also be more inclined to commit penalties, as they may have more false-starts as the offensive line is trying to get a 'jump' on the defensive line. They must also make running lanes for their running back to move the ball up the field. [47]

When running the regressions mentioned above I observed a statistically significant coefficient on *after* as well as *offplayspergame,* a measure of offensive possession. I reject the hypothesis *after* is a non-negative number and that *after* is equal to zero. This shows that after the rule change in 2004, there was a decrease in aggregate

[46] "Ground and pound" teams are teams whose offense plays a higher ratio of running plays than passing plays. Such teams rely on their offensive line's size and skill to create productivity in their running plays, as they usually run the ball through the defensive line.

[47]Appendix 2 shows regression analysis of similar variables as model (1), (2), (3) and (4) but with all the variables (including the dependent variable) being aggregate for the entire year.

Table 3.1: Selected regressions of random effect model

	Yards Penalized Per Game							
Model	[1]	z statistic	[2]	z statistic	[3]	z statistic	[4]	z statistic
after	-3.913168	*-6.57*	-4.02667	*-6.76*	-4.184069	*-6.98*	-4.044336	*-6.78*
offplayspergame	0.3285278	*3.66*	0.2903561	*3.23*			0.3044649	*3.38*
carriespergame	...	...	...	...	0.1783353	*1.83*	...	...
passattemptspergame	...	...	...	...	0.4064694	*4.41*	...	...
offydspergame	0.0241635	*1.96*	...	...	0.019821	*1.6*	0.0298132	*2.24*
rushydspergame	...	...	0.0059212	*0.45*	...	...	...	...
passydspergame	...	...	0.0345715	*2.75*	...	...	...	...
offtdspergame	-0.9544744	*-1.28*	-0.8023814	*-1.08*	-0.7525522	*-1.01*	...	...
rushtdspergame	...	...	...	...	...	...	-2.2228	*-2.58*
passtdspergame	...	...	...	...	...	...	-0.5064709	*-0.56*
wins	-1.778195	*-4.62*	-1.80847	*-4.7*	-1.828741	*-4.76*	-1.786723	*-4.64*
losses	-2.270245	*-5.17*	-2.38229	*-5.42*	-2.471864	*-5.6*	-2.332246	*-5.33*
homegames	-0.2913058	*-0.63*	-0.2881983	*-0.62*	-0.2956034	*-0.64*	-0.2884724	*-0.62*
avgattendancepergame (in thousands)	-0.0237182	*-0.68*	-0.0221817	*-0.67*	-0.0231587	*-0.7*	-0.0241516	*-0.71*
constant	54.46651	*7.15*	57.79832	*7.57*	60.16477	*7.78*	55.43303	*7.31*
A10	-2.559266	*-0.45*	0.6792848	*0.12*	1.52398	*0.27*	-1.10241	*-0.19*
ACC	1.109208	*0.42*	1.222623	*0.49*	1.437906	*0.57*	1.394319	*0.55*
B10	-5.960534	*-1.94*	-5.576796	*-1.91*	-5.551528	*-1.9*	-5.677344	*-1.91*
B12	3.638946	*1.3*	3.628171	*1.36*	3.529835	*1.33*	3.877026	*1.43*
BE	4.145464	*1.71*	4.601685	*1.97*	4.669603	*2*	4.431066	*1.87*
BWC	1.153346	*0.27*	1.66952	*0.39*	1.506659	*0.35*	1.016232	*0.24*
CUSA	3.158957	*1.5*	3.226337	*1.59*	3.262165	*1.61*	3.26141	*1.59*
IND	2.659068	*1.04*	2.653495	*1.06*	2.632593	*1.06*	2.711301	*1.08*
MWC	-0.4817555	*-0.18*	0.0369407	*0.01*	0.1500604	*0.06*	-0.0857657	*-0.03*
P10	7.74413	*2.71*	7.488431	*2.77*	7.520514	*2.78*	7.630813	*2.77*
SB	7.50207	*3.01*	8.017368	*3.35*	8.037588	*3.36*	7.854637	*3.24*
SEC	1.879823	*0.6*	1.956069	*0.66*	1.927387	*0.65*	1.973033	*0.66*
WAC	4.282524	*1.83*	4.65778	*2.07*	4.633515	*2.06*	4.603918	*2.02*

*Dummy variable omitted is the Mid-American Conference
* Model (1): (1167 Observations, Number of Groups=120) (Wald chi-squared(21) = 266.13) (R-squared: within = 0.1594, between = 0.3887, overall = 0.2522)
* Model (2): (1167 Observations, Number of Groups=120) (Wald chi-squared(21) = 282.90) (R-squared: within = 0.1616, between = 0.4274, overall = 0.2688)
* Model (3): (1167 Observations, Number of Groups=120) (Wald chi-squared(21) = 283.84) (R-squared: within = 0.1615, between = 0.4316, overall = 0.2614)
* Model (4): (Wald chi-squared(21) = 275.37) (R-squared: within = 0.1607, between = 0.4098, overall = 0.26

yards penalized per game by 4.04 yards, depending on the model in table 3.1. This shows that all else equal, with the rule change in 2004 the mean aggregate yards penalized per game decreased by 7.02% at the mean (for model (1)).[48] With these regressions both *wins* and *losses* had statistically significant non-different negative coefficients. I rejected the test that *wins* and *losses* are non-different. Also in table 3.1 the variable *offplayspergame* is statistically significant and non-negative for all models (excluding model (3) in which is divided into passing and rushing plays are both statistically significant and non-negative).

This suggests that most penalties on the football field occur on the offensive side of the ball, as *offplayspergame* represents possession. The coefficient for *offplayspergame* on average of the three models, .3078, suggests that for every first down (or an extra 4 plays) on offense, a team's yards penalized per game will increase by one 1.231 or 2.21% at the mean. Another interesting way to analyze this is how offensive plays are divided into the style of play of the individual team shown in model (3). The coefficients of *carriespergame* and *passattemptspergame* are .1783 and .4065 respectively, they are both statistically significant, non-negative numbers, and reject that they are the equivalent. With the same intuition as before, this shows that a team who is more inclined to choose a higher mix of passing plays will increase their penalty yards per game by a greater amount than if they were to have an even mix of passing and rushing plays. Thus, for only an extra 4 plays a team applies to their strategy their yards penalized per game will increase at the

[48] Model (2) (3) and (4) show a percent decrease at the mean of 7.23, 7.51 and 7.26 respectively.

mean by 2.92% for passing and a trivial 1.28% increase in rushing plays, all else equal.

The results of table 3.1 shows evidence of the shaming effect given the rule change in 2004, while taking into account different variables representing teams who apply different offensive methods. These findings show that the shaming effect does in fact increase the cost of committing a penalty for individual players. Holding all else equal, this increase in the cost will reduce penalties on the margin. When there is an increase in the cost of committing a crime, there will be deterrence of the crime. Society should shift the allocation of detection and prosecution accordingly as the sanctioned crime is committed less. The NCAA had no direct intention of reducing the penalties by implementing the rule change of 2004, but, the rule change did have a significant effect due to shaming.

Society must be careful in strictly increasing the cost of committing a crime (assumed to include shaming as well as other sanctions). An increase in the cost of committing a crime will reduce that particular crime, but a criminal may substitute to a crime that has a lower cost of punishment, but cost more to society. Thus, if there is a criminal act that has a greater harm to society with a lower cost of committing, the criminal will behave on their second best option. It is assumed that there is a threshold for punishment of criminal activity.[49] If there are no limits to punishment, with costless sanctions and prosecution, the optimal solution of preventing crime is to have significantly steep punishment and have arbitrarily low

[49] See Friedman (1981) and Polinsky and Shavell (1984). They both assume that there is a limit to punishments.

monitoring.[50] Due to the fact that the NCAA did not intend on reducing the penalties, it is assumed that there was a marginal increase in the cost, but the shaming effect did not increase the cost significantly close to such a threshold. This section shows that the rule change did have a behavioral effect on penalties committed. The next section shows what such behavioral effects have on the output of the game.

3.2 Rule Change and the Effect on Output of the Game

This section explores the substitution effect of an increase in cost a criminal faces with the introduction of shaming. An increase in the cost of committing a crime will tend to decrease the crime rate of that particular crime, ceteris paribas. As the cost of committing a crime increases, criminals may alter their behavior to find more lucrative crimes or better ways of deceiving the enforcing agent of that particular crime. An increase in other criminal activities or better deception by the criminal may cause the enforcing agent to improve their probability of catching the criminal. Enforcing agents as well as other agents may incur costs due to the influx in the more lucrative crime. Such changes by the enforcing agent will impose undesired social costs.[51]

McCormick and Tollison (1984) show the substitution effect with an increase in the probability of detection. They show that as the detection rate of a particular crime increases, theoretically the best response is for the criminal to substitute

[50] See Mookherjee and Png (1994).
[51] Tullock, (1967), "The Welfare Costs of Tariffs, Monopolies, and Theft." (p.231)

away from the crime with the increased likelihood of detection. The substitution from the original crime will tend to cause the probability of detection to decrease in the aggregate. They also acknowledge that criminals will be willing to use their resources so that they can decrease their individual probability of detection a particular crime. This suggests that as a criminal is increasing their skill of a particular crime, there will be a decline of any other productive activities the criminal would have partaken in. Such a decline will lead to further social costs, as the crime rate does not decrease but socially productive activities will. If the probability of detection or the cost of a particular crime increases, an individual may not substitute to another crime but better their success rate of such a crime.

On the football field this suggests that players can invest their time in avoiding detection of penalties they commit, learn how to avoid penalties the opposing team may commit and not be detected, or learn to draw attention to penalties that are committed against them. Learning such practices will cause a player to substitute away from activities that increase their productivity on the football field. This suggests that substituting away from productive activities will decrease the time players spend learning how to better their team's probability of winning. This paper suggests that an increase in the cost of committing a penalty given by the rule change may increase the substitution from practicing productive techniques to techniques that reduce the output of the team, and decrease the average score of their team.[52] A non-negative correlation of the rule change and output would further strengthen the idea that the change decreased penalties

[52] Shown in McCormick Tollison (1984) scoring is assumed to be economic output while winning is technical output. Economic output and technical output are monotone transformations of each other.

committed in the aggregate and thus there is no substitution effect, cleaner play, and no decrease in output. This paper tests that the rule change of 2004 did in fact lead to a decrease in penalties, as opposed to players learning how to better commit penalties without being detected.[53]

This paper found that there is a behavioral change in committing a crime, by the unintended use of the shaming effect. This section investigates the effect shaming has on output. That is, if a crime has a shaming sanction included in preexisting sanctions will there a noticeable decrease in that particular crime? The previous section shows the shaming effect dis-incentivizes individuals of committing a crime by increasing the cost of that particular crime. Even if there is a decrease in the behavior of the criminal due to the shaming effect, it may not be correlated with a significant decrease of that particular crime committed in the aggregate. If one individual (with a specific risk profile) on the margin faces an increase in the cost of committing a crime, then he will not have an incentive to commit the crime. But, any other individual on the margin who has a different risk profile or will be affected differently by the increase in cost, and theoretically will still commit the crime. Thus, in the aggregate the crime rate may not decrease due to the substitute of another individual. This paper suggests the behavioral effect of shaming will tend to be only a marginal effect, and there will be no significant decrease in criminal activity in the aggregate.

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[53] Assuming that a player is perfectly rational an increase in individual cost of committing a penalty should have no effect on penalties committed. Thus, showing that there is a decrease in penalties committed in the previous section, this should lead to a further decrease in output of the team due to a misalignment of incentives of the player and the team assuming that players were optimally committing penalties before the rule change.

Table 3.2 tests the effects the rule change had on the output of football games from 2000-2009. Both models are ordinary least squares regressions containing all variables described in the previous section, with an additional variable *intpergame,* which represents interceptions each team committed per game each year. Model [1] has the dependent variable average score, which is the average score each team scored per game each year.

Table 3.2: Selected regressions of output models

Model [1] dependent variable: Average score per game Model [2] dependent variable: Average intra-conference point differential				
Model	[1]	t statistic	[2]	t statistic
after	-0.524341	-2.77	-1.277866	-2.47
offplayspergame	-0.1842068	-7.07	-0.307578	-4.33
offydspergame	0.1035056	49.47	0.1069237	18.73
intpergame	-2.508635	-9.67	-7.402845	-10.45
homegames	0.3104557	2.42	-0.6406928	-1.83
avgattendancepergame (in thousands)	0.0464768	7.94	0.1986672	12.43
constant	0.7316343	0.43	-9.505487	-2.05
A10	-0.9799424	-0.71	-7.397408	-1.95
ACC	-1.264738	-2.81	-5.536811	-4.50
B10	-3.055006	-6.12	-11.72826	-8.61
B12	-0.3117854	-0.68	-9.957811	8.01
BE	-0.1929553	-0.42	-4.345569	-3.45
BWC	-0.6224338	-0.49	-4.093927	-1.19
CUSA	-0.2405673	-0.61	-2.321912	-2.14
IND	-0.6426849	-1.17	-4.927897	-3.30
MWC	-1.175605	-2.72	-2.882304	-2.45
P10	-0.7973577	-1.75	-7.562221	-6.08
SB	-0.9182196	-2.02	3.404405	2.61
SEC	-2.645434	-5.19	-11.57751	-8.32
WAC	-0.2336452	-0.55	-2.451439	-2.12

*Dummy variable omitted is the Mid-American Conference
* Model (1): (1164 Observations) (Adjusted R-squared = 0.8157)
* Model (2): (1163 Observations) (Adjusted R-squared = 0.4950)

Model [1] tests that each players are committing fewer penalties, and not using resources to learn how to better deceive the detecting agents. The coefficients of interest to test this hypothesis are -0.521759 and 0.1035036, which are associated with the variable *after* and *offydspergame* respectively. The coefficient of the variable *after* shows that after the rule change of 2004 there was a decrease in the average score of all teams each year (all else equal). Shown in the previous section the average decrease in yards penalized per game was 4.04. Given by the Coasian Theorem, the decrease in yards penalized per game is the same as each team increasing their average yards per game by 4.04.[54] Thus, when looking at the coefficient of *offydspergame* in model [1] and the findings of the previous section shows the average score increased by 0.418, which nearly offsets the coefficient of *after* of model [1] in table 3.2 (all else equal).

Model [2] has the dependent variable of average score differential of intra-conference games each year. Average score differential tests the effect the rule change has output for all teams. With the same intuition as before the coefficient of *offydspergame* in model [2] is 0.1068843. With the increase in yards per game of 4.04 this shows that the rule change increased the average score differential by .43181257 (all else equal). This trivial amount shows that there was a behavioral effect given by the rule change, but the output of a football game given by the rule change is very marginal.[55]

That is, the use of the shaming effect on criminal behavior may have an effect on the marginal level, but with this theory there should be no significant decrease in the crime rate in the aggregate. What must be noted is that all penalties do not

[54] This is assuming that all penalties occur on the offense. This is not necessarily case for all penalties, but for the purpose of this paper this assumption is held. Holding such an assumption forces the magnitude of the findings to be biased and larger than the actual effects of the rule change has on output.

[55] The coefficient of *after* in model [2] of table 3.2 is 1.3744. Thus, 0.43181257-01.3744=-0.942587 which shows that the average intra-conference point differential is less than one point, a marginal amount.

happen to the offense. Thus, the coefficient found in the previous section must be lower than 4.04 for only offensive penalties. This implies that there was a decrease in average scores per game each year after the rule change. There can be many different reasoning's with the correlation of the decrease in the average score per game. One theory of this paper is that players are adjusting to the increase in costs of committing a penalty and are learning to better avoid detection. Another theory can be due to the decrease of time the coaches receive information about the penalty. With the rule change, the player who commits a penalty is immediately announced publicly, thus allowing the coaches to react much more quickly. If this is the case, the coaches will have a better opportunity to substitute the player who committed a penalty (player A) with the second best player (player B).

In theory a rational coach will substitute player B for player A if it optimizes the team's chance to win the game. This might not always be the case. A rational coach will want to increase the probability of winning all games, now and in the future. That is, if the skill gap of player A and player B are not significantly large, then the coach will be more likely to substitute the player A for player B. The reason of substituting may be for different reasons. The coach may believe that player B will not commit as many penalties as player A and will increase the team's probability of winning the immediate game. The coach may also want to show the wrongness of player A's penalty to him and the team. This incarceration of player A is meant to deter any future penalties player A (and the team) may commit in future games, thus increasing their probability of winning future games. In theory the substitution rate of player A and player B don't only rely on the skill gap between the players, but also the probability of winning the immediate game as well as future games. The rate of substitution can also be a function of the schedule at hand. That is, if the team is playing their first game (T0) out of n games (Tn), then the coach may be willing to substitute player B for player A as long as the expect discounted future benefits of future games is greater than the expected cost of playing player B in the immediate game. But, as the season progresses there will be less benefit for deterring player A of committing future penalties. That is if the team is playing game Tn-1 as apposed to T0, the expected benefit of deterring future penalties will be less, as they only have one more game to benefit and may not be as willing to substitute player B for player A.[56]

One contingency of this paper is the rule change affected all penalties committed by all players. The shaming effect is thought to have little to no effect if it were included in sanctions of all crimes. As mentioned before, there will be significant differences of the deterrent effect given by shaming on different crimes. The reasoning can be the stigma of committing a particular crime has with society, as well as the differences in criminals who commit particular crimes.[57] The next section with discuss the differences in individuals, and will look at different teams to determine if there is a significant difference given an appropriate proxy for their risk profiles.

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[56] This theory can be applied to in-game settings. Where T0 refers to the beginning of the game and Tn refers to the end of the game.

[57] Brain Netter (2005) states, "The stigmatizing effect of publicizing crime are costly for the people being shamed, and these costs have the potential to deter shamed convicts from repeating their criminal acts." (p. 188)

3.3 Analysis of Rule Change and Risk Profile

One of the assumptions of this paper is that due to the changing dynamics of the game we must assume that players in the aggregate are risk neutral. When discussing the deterrent effect of criminal behavior it is not always suitable to make assumptions of the risk profiles of criminals. Becker (1968) shows that change in the probability of detection will have a larger effect on those individuals who are risk seeking, while a change in the fine will have a larger effect on those who are risk adverse. This section tests the effects the rule change, a change in the fine or punishment, has on individual teams with different risk preferences.[58]

Analyzing criminal behavior relies strongly on the risk preferences of the individual. The caveat is that it is difficult for economists to find data on such an essential but nearly immeasurable variable. This paper uses a ratio of the number of field goals a team kicks divided by the number of touchdowns a team scores as a measurable proxy for risk preferences of teams. The number of field goals a team kicks can relate to how conservative an individual team plays, which will help to understand the teams risk preferences. It is assumed that a team who kicks a higher number of field goals relative to touchdowns tends to play more conservatively than a team who would rather take risks to get the touchdown and greater reward, all else constant. That is, in college football, if a team is within sure field goal range (for example inside the opponent's 20 yard line) their style of play may change to a more conservative nature to insure they will get the points of the field goal. They also have the opportunity of going for a first down on a fourth down, in attempt to score

[58] The assumptions of the previous model hold, excluding that of risk neutrality.

a touchdown.[59] Given the risk profile proxy of the team, the rule change should have a greater effect on teams who kick more field goals relative to touchdowns in a season, holding all else constant. That is, the rule change in 2004 will have a negative relationship of yards penalized of all teams but will have a greater effect on teams that are more risk adverse ceteris paribas (given by a higher number of field goals kicked in a given season).

This paper classifies teams into four different categories depending on the number of field goals they kicked divided by the number of touchdowns a team scores in a given season. A high field goal-touchdown ratio team is considered a team that has a ratio greater than one standard deviation of the mean of the sample; a low field-touchdown ratio team is one standard deviation below the mean of the sample (the upper/lower 15.8 percent of the sample). The other two categories are classified at mid-high and mid-low field goal-touchdown ratio teams. These are defined as teams whom, in a given season; ratios are above (below) the mean field goal-touchdown ratio, and below (above) one standard deviation of the mean field goal-touchdown ratio, representing 34.1 percent of the sample each.

Graph I shows the mean change in yards penalized per game from 2000-2004 for all teams as well as high and low field goal-touchdown ratio teams. When looking at the graph it shows that there is a significant decrease in the mean yards

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[59] Romer (2006) shows that teams are not maximizing their chances of winning a game when kicking a field goal or punting the ball on fourth down by looking at the National Football League. Though he comments that this conservative play is not solely on risk aversion, due to the outcome of the game with a team winning and a team losing. This says that even with a large cost of losing and little benefit of winning each team should maximize the probability of winning. For the purpose of this paper the use of field goals can be understood as a proxy for risk preferences on the collegiate level when looking across an entire season, and not at an individual game like Romer's findings. Also, Romer lacks that teams may change their play calling as the team is within field goal range, for the guaranteed points, where Romer only takes the fourth down into consideration.

penalized per game for all teams in 2006.[60] One reason of the decline in 2006 can be thought of as a lag effect the rule change may have.[61] What is interesting about analyzing the mean yards penalized is that the teams with a high field goal-touchdown ratio has a much more pronounced decrease in yards penalized per game. This deviation from the mean yards penalized for all teams is perceived to be due to the increased effect the rule change had on risk adverse teams. From 2003 to 2004 there was a mean decrease in yards penalized per game of 5.27% for high field goal-touchdown ratio teams, and 2.42% for low field goal-touchdown kicking teams.

Graph 3.1: Mean yards penalized per-game, 2000-2009

The lag effect of 2006 had a decrease of 22.00% and 4.77% mean yards penalized per game for high and low field goal-touchdown ratio teams from 2005-2006. From 2000 to 2009 high field goal-touchdown ratio teams had a mean yards

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[60] Note there was no significant rule changes from 2004-2006 that would have an effect on yards penalized per game. Thus, table II shows the outcome of statistical regressions that control for other variables, trying to control for these unobservable variables.

[61] The NCAA noted that not all referees or facilities were properly equipped with microphones or supporting pa equipment. Thus, the assumption of the rule change having a lag effect is valid.

penalized per game decrease of 14.02% while low field goal-touchdown ratio teams had an increase of 10.48%.[62]For all divisions of the data, the mean and standard deviations where found for years between 2000-2003 and 2004-2009. Thus, there were two means and two standard deviations representing the years before the rule change and after the rule change. This ensured that there were suitable observations for all division of the data, while also better explaining the effect the rule change had on each division of the data. The regressions controlled for the four categories of field goal–touchdown ratios, including the two appropriate subdivisions of the data for the years before and after the rule change. Table 3.3 shows the results of this analysis, using similar base variables as in table 3.1, and controlling for the teams in each of the four categories of field goals kicked.[63] Model [1] presents the results of low field goal kicking teams, [2] and [3] are mid-low and mid-high respectively, and model [4] are the results for high field goal kicking teams.

When looking at table 3.3 it is evident that the rule change had little effect on the different risk profiles of individual teams. In contrast to change in the mean yards penalized per game shown in graph 2.1, I failed to reject the hypothesis that the coefficient of *after* (which represents the rule change) is non-different. All coefficients of *after* are statistically significant to the 90th percentile, but are not distinguishable from each other category. This shows that the increase in the cost of committing a penalty given by the rule change in 2004 has a significant effect on all

[62] The mean percentage change of yards penalized per game for all teams are: 2003-2004=-2.61%, 2005-2006=-15.02%, 2000-2009=-11.48%.

[63] See section 3 for further description of the variables used.

Table 3.3: Selected regressions of risk profile

Yards Penalized Per Game (Controlling for FG/TD Ratio)								
Model	[1]	z statistic	[2]	z statistic	[3]	z statistic	[4]	z statistic
after	-3.273929	*-1.79*	-3.874597	*-3.84*	-5.406485	-4.73	-3.075754	-1.8
passattemptspergame	0.5904519	*2.26*	0.2825272	*1.94*	0.3092477	1.8	1.046748	3.74
carriespergame	0.1808084	*0.64*	0.0827576	*0.55*	0.0234904	0.13	0.9292336	3.15
offydspergame	0.0040252	*0.17*	0.0320639	*2.37*	0.0290506	1.71	-0.0304501	-1.09
wins	-1.588265	*-1.41*	-2.642222	*-4.08*	-1.714896	-2.3	-0.7713894	-0.67
losses	-2.179719	*-1.71*	-2.886087	*-3.97*	-2.550612	-3.06	-1.593187	-1.23
homegames	-0.4384267	*-0.36*	-0.4013959	*-0.52*	-0.4744592	-0.55	-1.035413	-0.82
avgattendancepergame (in thousands)	0.0797566	*1.02*	-0.0027746	*-0.06*	-0.0795924	-1.57	0.0462702	0.71
constant	54.27079	*2.29*	67.43587	*5.57*	65.7156	4.57	14.17047	0.6
A10	0.454498	*0.04*	-1.529226	*-0.22*	(dropped)	...	(dropped)	...
ACC	2.62389	*0.42*	1.983294	*0.6*	6.658599	1.88	0.3923476	0.08
B10	-11.10145	*-2.07*	-6.818283	*-1.89*	-2.073675	-0.48	-2.79295	-0.52
B12	-2.663121	*-0.54*	2.60717	*0.8*	6.065229	1.58	11.24617	2.07
BE	5.083108	*1*	3.139775	*1.02*	6.787553	1.88	10.55977	2.21
BWC	(dropped)	*...*	2.528914	*0.49*	1.30228	0.13	(dropped)	...
CUSA	-4.305634	*-1.03*	4.003566	*1.47*	5.262514	1.7	5.711897	1.25
IND	2.397399	*0.49*	0.8525207	*0.23*	1.45383	0.39	-6.444735	-0.91
MWC	-2.154378	*-0.4*	-0.4301562	*-0.13*	3.509101	1.03	0.3751743	0.08
P10	3.985595	*0.71*	5.764333	*1.75*	10.21188	2.86	11.59609	2.22
SB	10.51826	*2.42*	9.805117	*3.23*	7.219726	2.02	7.136261	1.02
SEC	-3.812611	*-0.66*	1.162279	*0.32*	5.42883	1.28	2.886601	0.51
WAC	3.684748	*0.87*	4.344662	*1.54*	6.965461	1.91	12.67463	2.25

*Dummy variable omitted is the Mid-American Conference.
* Model (1): (153 Observations, Number of Groups=82) (Wald chi-squared(20) = 52.18) (R-squared: within = 0.1665, between = 0.3716, overall = 0.3381)
* Model (2): (507 Observations, Number of Groups=119) (Wald chi-squared(21) = 110.64) (R-squared: within = 0.1304, between = 0.3165, overall = 0.2317)
* Model (3): (341 Observations, Number of Groups=111) (Wald chi-squared(20) = 132.79) (R-squared: within = 0.2694, between = 0.3317, overall = 0.3120)
* Model (4): (163 Observations, Number of Groups=79) (Wald chi-squared(19) = 74.20)(R-squared: within = 0.2415, between = 0.4782, overall = 0.3590)

teams, but do not vary depending on the risk profile of the teams. Though in the data there is a statistically significant result of the rule change, it is a decrease of yards penalized per game on the margin for all teams. When separating the teams into the four different categories results rule change, it is a decrease of yards penalized per game on the margin for all teams. When separating the teams into the four different different categories results show that the rule change is still significant, but only marginally for all four types of risk profiles.

The two rationales of such results may be due to the variance of the risk profiles of teams as the game progresses. That is, depending on the dynamics of an individual game a team may be maximizing their return by changing their style of play from risk seeking to risk adverse, or visa versa. And thus the best assumptions of the risk profiles of teams in this data are thought to be risk neutral. The other reason of having non-distinguishable effects may be that the rule change has such a marginal deterrent effect of all teams. A team that is very risk adverse may not have much of a difference because the shaming effect is so small and measured on the individual level. There may be more pronounced differences if future studies would divide the individual players into different risk profile subdivisions.

Crimes that have a greater deterrent effect due to shaming may portray more distinguishable results on differing risk profiles. A crime that is most commonly committed by risk adverse criminals, such as white-collar crimes, may have a greater deterrent effect of shaming. An analysis of two separate crimes that are dominantly committed by differing risk profiles will theoretically show distinguishable deterrent effects. The analysis of this data shows the effect of shaming and shows that there is a deterrent effect on the margin, but there is no difference in the teams divided subdivisions of risk profile.

4 Summary and Conclusion

This paper presents the supply side of the economic crime model, where criminal behavior is endogenous of cost incurred when committing a specific crime and the probability of being detected. The lack of data on the shaming effect and the affects it has on criminal behavior forced this paper to use an analogous situation given by the sports community. This paper shows that a decrease in the yards penalized per game is correlated with the rule change of 2004, which presented a shaming effect to all players. With an introduction of an alternate sanction, such as shaming, there will be an increase in the cost criminals face. This paper shows that an introduction of shaming in criminal sanctions will affect the behaviors of criminals though, there are no political implications that follow these results.

The shaming effect forces different individuals to face different increases in costs due to their risk profile. Due to this paper looking at team seasonal statistics, it was unable to see the individual affect of shaming. This paper suggests the introduction of shaming will decrease mean criminal behavior by 7 percent. In theory, if shaming was introduced to a crime that is committed by individuals whom are dominantly risk adverse there will be a larger decrease in criminal behavior than presented in this paper. The sports community allows economists to take well-documented quantitative data and apply the results to real world situations. •The results of introducing alternative sanctions such as shaming to criminal punishment will tend to have marginal decrease in criminal behavior. The effect of all criminal activity will be unclear due to exogenous characteristics of individual criminals, and the use of it is well document.

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Appendix 1

Hausman Test

This appendix uses the Hausman test to show that the use of random effects estimator for table 3.1 is efficient for models 2-4. Model [1] is inconsistent when using the random effects estimator model, but is included in table 3.1 for generality. Table 1.A uses the same coefficients in models [1]-[4] in table 3.1 by using the fixed effects estimator. When looking at table 1.A it shows that there is a difference in the findings of model [1], but the key variable *after* is only changed slightly. That is, model [1] of table 3.1 shows there is a 7.02 percent decrease in yards penalized per game at the mean, while model [1] of table 1.A (fixed effects estimator) shows there is a 6.08 percent decrease in yards penalized per game at the mean. Thus, the coefficient *after* is biased upwards using random effects estimator for model [1], but using fixed effects estimator does not hurt the integrity of the model. Models [2]-[4] fail to reject the null hypothesis of the Hausman test, which means that the random effects and fixed effects estimates are sufficiently close.

Table 1.B shows the findings using the Hausman test for models [1]-[4] of table 3.1. Presented in table 1.B are the differences of the coefficients of the fixed effect estimator and the random effect estimator (b-B), and the standard error of the difference of the coefficients (sqrt(diag(V_b-V_B))).

Table 1.A: Selected regressions of fixed effect model

Yards Penalized Per Game								
Model	[1]	t statistic	[2]	t statistic	[3]	t statistic	[4]	t statistic
after	-3.38798	-5.5	-3.442028	-5.59	-3.524288	-5.68	-3.442284	-5.58
offplayspergame	0.3792276	4.12	0.3576141	3.87	...	...	0.3668248	3.97
carriespergame	...	...	...	...	0.2971389	2.92	...	...
passattemptspergame	...	...	...	...	0.4215735	4.46	...	...
offydspergame	0.0189877	1.5	...	...	0.0171786	1.36	0.02198	1.61
rushydspergame	...	...	0.0088622	0.65	...	...	...	...
passydspergame	...	...	0.0252859	1.94	...	...	...	...
offtdspergame	-1.026849	-1.35	-0.9525399	-1.26	-0.9339345	-1.23		
rushtdspergame	...	...		...	...	...	-1.700152	-1.93
passtdspergame	...	...		...	...	...	-0.7302588	-0.79
wins	-1.607837	-4.09	-1.62466	-4.14	-1.634697	-4.17	-1.616653	-4.12
losses	-2.073735	-4.68	-2.131214	-4.8	-2.176302	-4.88	-2.089135	-4.73
homegames	-0.3447243	-0.72	-0.3351467	-0.7	-0.3395763	-0.71	-0.3459903	-0.73
avgattendancepergame (in thousands)	-0.1460055	-2.06	-0.1469171	-2.07	-0.149378	-2.11	-0.1484672	-2.09
constant	59.86699	7.4	61.51497	7.57	62.80966	7.63	60.05239	7.45
A10	-0.7130286	-0.1	1.692963	0.24	1.938592	0.27	0.5233522	0.07
ACC	-8.304404	-1.54	-8.201467	-1.53	-8.005651	-1.49	-7.918962	-1.47
B10	(dropped)	...	(dropped)	...	(dropped)	...	(dropped)	
B12	(dropped)	...	(dropped)	...	(dropped)	...	(dropped)	
BE	-0.5194627	-0.13	-0.0325557	-0.01	-0.0712644	-0.02	-0.1648999	-0.04
BWC	-6.252007	-1.07	-5.454225	-0.93	-5.687168	-0.97	-6.097491	-1.04
CUSA	-0.1835031	-0.05	0.2605553	0.07	0.1313493	0.04	0.1411919	0.04
IND	0.7745822	0.19	1.065012	0.26	0.8824852	0.22	1.049911	0.26
MWC	-6.804774	-1.01	-6.358471	-0.95	-6.755707	-1	-6.270952	-0.93
P10	(dropped)	...	(dropped)	...	(dropped)	...	(dropped)	
SB	0.8277637	0.17	1.578169	0.33	1.476215	0.3	1.266826	0.26
SEC	(dropped)	...	(dropped)	...	(dropped)	...	(dropped)	
WAC	-3.272053	-0.74	-2.40849	-0.54	-2.544278	-0.57	-2.730302	-0.61

*Dummy variable omitted is the Mid-American Conference.
* Model (1): (1164 Observations, Number of Groups=119) (R-squared: within = 0.1700, between = 0.0199, overall = 0.0721)
* Model (2): (1164 Observations, Number of Groups=119) (R-squared: within = 0.1731, between = 0.0368, overall = 0.0865)
* Model (3): (1164 Observations, Number of Groups=119) (R-squared: within = 0.1729, between = 0.0381, overall = 0.0871)
* Model (4): (1164Observations, Number of Groups=119) (R-squared: within = 0.1719, between = 0.0293, overall = 0.0808)

Table 1.B: Hausman Test

Hausman Test [b=Fixed Effect] [B=Random Effect]								
	Model 1		Model 2		Model 3		Model 4	
	b-B	sqrt(diag(V_b-V_B)) S.E.	b-B	sqrt(diag(V_b-V_B)) S.E.	b-B	sqrt(diag(V_b-V_B)) S.E.	b-B	sqrt(diag(V_b-V_B)) S.E.
after	0.5251884	0.1587125	0.5846421	0.1560235	0.6597814	0.1586181	0.6020524	0.1574196
offplayspergame	0.0506998	0.0195899	0.067258	0.0208655	...	...	0.0623599	0.0205835
carriespergame	...	...	...	...	0.1188036	0.0285301	...	...
passattemptspergame	...	...	...	...	0.0151041	0.0210716	...	...
offydspergame	-0.005176	0.0027806	...	...	-0.002642	0.0026986	-0.007833	0.0029193
rushydspergame	...	...	0.0029409	0.002756	...	...	...	...
passydspergame	...	...	-0.009286	0.003379	...	...	...	...
offtdspergame	-0.072374	0.1414553	-0.150159	0.1402049	-0.181382	0.1420476	...	...
rushtdspergame	...	...	...	...	...	...	0.5226479	0.1872937
passtdspergame	...	...	...	...	...	...	-0.223788	0.1693669
wins	0.1703579	0.0789899	0.1838101	0.0777814	0.1940446	0.078577	0.1700694	0.0766635
losses	0.1965096	0.0622176	0.2510761	0.0597221	0.2955626	0.0638535	0.2431104	0.0595855
homegames	-0.053419	0.1141361	-0.046948	0.1169699	-0.043973	0.1176323	-0.057518	0.1151939
avgattendancepergame (in thousands)	-0.122287	0.0618296	-0.124735	0.0624881	-0.126219	0.0625715	-0.124316	0.0623244
A10	1.846237	4.19246	1.013678	4.363113	0.4146124	4.376624	1.625763	4.345556
ACC	-9.413612	4.692641	-9.42409	4.746691	-9.443557	4.75243	-9.313281	4.727488
BE	-4.664927	3.351797	-4.634241	3.410923	-4.740867	3.413017	-4.595966	3.396858
BWC	-7.405353	3.895204	-7.123744	3.955466	-7.193827	3.950309	-7.113723	3.924349
CUSA	-3.34246	2.948925	-2.965781	3.003045	-3.130815	3.002016	-3.120218	2.992473
IND	-1.884486	3.188867	-1.588483	3.239048	-1.750108	3.239509	-1.66139	3.225753
MWC	-6.323019	6.174724	-6.395412	6.223642	-6.905768	6.222463	-6.185187	6.22124
SB	-6.674306	4.147993	-6.439199	4.216034	-6.561372	4.216046	-6.587811	4.197686
WAC	-7.554576	3.750255	-7.06627	3.825429	-7.177793	3.822821	-7.334221	3.81

*Dummy variable omitted is the Mid-American Conference
*Big Ten, Big Twelve, Pacific Ten, South Eastern Conference are all dropped
* Model (1): Prob>Chi-squared=0.1931
* Model (2): Prob>Chi-squared=0.0044
* Model (3): Prob>Chi-squared=0.0174
* Model (4): Prob>Chi-squared=0.0090

Appendix 2

Annual Regression

This appendix uses the same variables as in table 3.1, using annual statistics in replace of per game statistics and the dependent variable being annual yards penalized. Table 2.A presents the results of the random effects estimators of models 1-4 with annual statistics.

Table 2.A: Selected regressions of random effect model (Annual)

Yards Penalized								
Model	[1]	z statistic	[2]	z statistic	[3]	z statistic	[4]	z statstic
after	-47.90159	-6.59	-49.50995	-6.81	-51.19848	-7	-49.45913	-6.79
offplays	0.334803	3.75	0.2876457	3.23	…	…	0.3110945	3.47
carries	…	…	…	…	0.1864936	1.92	…	…
passattempts	…	…	…	…	0.4119668	4.49	…	…
offyds	0.0227503	1.84	…	…	0.0181899	1.47	0.0280644	2.09
rushyds	…	…	0.0749806	0.47	…	…	…	…
passyds	…	…	0.0347583	2.81	…	…	…	…
offtds	-0.9372593	-1.26	-0.8719383	-1.19	-0.7345965	-0.99	…	…
rushtds	…	…	…	…	…	…	-2.173982	-2.53
passtds	…	…	…	…	…	…	-0.4797257	-0.53
wins	5.915563	0.94	9.663473	1.45	9.819743	1.54	6.603912	1.05
losses	0.5758682	0.09	3.273197	0.48	2.636865	0.41	0.6111579	0.09
homegames	-2.398544	-0.38	-2.400737	-0.38	-2.469238	-0.39	-2.359045	-0.37
accuattendance(in thousands)	-0.0331	-0.52	-0.0324448	-0.54	-0.0335784	-0.56	-0.0344662	-0.56
constant	314.8859	5.29	309.9892	4.96	329.8058	5.57	317.4998	5.36
A10	-27.46976	-0.4	9.518639	0.14	19.38341	0.28	-10.87827	-0.16
ACC	9.426253	0.3	11.30109	0.38	13.73063	0.46	13.00879	0.43
B10	-77.07881	-2.11	-71.71991	-2.06	-71.45146	-2.06	-73.36543	-2.08
B12	41.23386	1.24	41.99785	1.33	40.46777	1.29	44.18612	1.38
BE	49.68099	1.71	55.41191	1.98	56.24709	2.01	53.20159	1.88
BWC	7.846493	0.15	14.09561	0.27	12.43904	0.24	6.9215	0.13
CUSA	34.50378	1.35	35.75635	1.46	36.16081	1.47	35.82141	1.44
IND	23.82184	0.76	24.47575	0.81	24.17443	0.8	24.31441	0.79
MWC	-4.287783	-0.13	2.358208	0.08	3.674373	0.12	0.5667818	0.02
P10	91.5909	2.7	89.06108	2.78	89.40257	2.79	90.48826	2.77
SB	90.1822	2.97	96.57476	3.32	96.79664	3.33	94.6154	3.21
SEC	20.0475	0.54	21.81889	0.62	21.44876	0.61	21.39246	0.6
WAC	53.1543	1.86	57.94488	2.12	57.49729	2.11	57.18111	2.07

*Dummy variable omitted is the Mid-American Conference.
* Model (1): (1164 Observations, Number of Groups=119) (Wald chi-squared(21) = 228.47) (R-squared: within = 0.1358, between = 0.3792, overall = 0.2379)
* Model (2): (1164 Observations, Number of Groups=119) (Wald chi-squared(22) = 252.00) (R-squared: within = 0.1381, between = 0.4443, overall = 0.2651)
* Model (3): (1164 Observations, Number of Groups=119) (Wald chi-squared(22) = 252.12) (R-squared: within = 0.1371, between = 0.4492, overall = 0.2668)
* Model (4): (1164 Observations, Number of Groups=119) (Wald chi-squared(12) = 241.97) (R-squared: within = 0.1367, between = 0.4183, overall = 0.2536)